II. REMARKS

By the present amendment, claims 18-34 have been amended, and new claims 35 and 36 have been added. Specifically, claims 18-34 have been amended to improve grammar, form and clarity, which has no further limiting effect on the scope of these claims. Independent claim 18 has been further amended to recite "carrying out, in the receiver device, an operation of adding the N windows in a coherent manner before data demodulation so that added pulse amplitude level is higher than noise amplitude level captured by the receiver device" as supported on page 8, lines 23-29, and on page 12, lines 14-17, and on page 13, lines 16-19, of Applicants' specification as originally filed.

Claim 31, which depends upon claim 18, has been further amended to recite a "receiver" that includes "modulation means for demodulating data from digital signals after the time window addition means" as supported on page 11, line 26, to page 12, line 17, of Applicants' specification as originally filed.

New claim 35 depends upon claim 29, and recites subject matter deleted from claim 29.

New independent claim 36 includes subject matter recited by previous claims 1 and 27. In fact, new independent claim 36 corresponds to previous claim 27 rewritten in independent form.

The present amendment adds no new matter to the above-captioned application.

A. The Invention

The present invention pertains broadly to a wireless data communication method between a transmitter device having a first wide band antenna for transmitting ultra wide band coded data signals, and a receiver device having a second wide band antenna for

receiving direct path and multiple path coded data signals, and to a receiver device for implementing the wireless data communication method. In accordance with a method embodiment of the present invention, a wireless data communication method is provided that includes steps and features recited by independent claim 18. In accordance with another method embodiment of the present invention, a wireless data communication method is provided that includes steps and features recited by independent claim 36. Various other embodiments, in accordance with the present invention, are recited by the dependent claims.

An advantage provided by the various embodiments of the presently claimed invention is that a wireless data communication method is provided that uses ultra-wide band encoded data signals, which is able to process, in a simple manner, all encoded direct path and multiple path signals picked up by the receiver device. Another advantage provided by the various embodiments of the presently claimed invention is that a wireless data communication method is provided that uses ultra-wide band data signals for maximizing the amplitude of the data pulses in relation to the noise picked up by the receiver device.

B. The Rejections

Claims 18-34 stand rejected under 35 U.S.C. § 112, second paragraph, as allegedly indefinite.

Claims 18-23, 25, 31, 33 and 34 stand rejected under 35 U.S.C. § 102(b) as allegedly anticipated by Cowie et al. (U.S. Patent Application Publication No. US 2003/0095609, hereafter the "Cowie Publication").

Claim 24 stands rejected under 35 U.S.C. § 103(a) as allegedly unpatentable over the Cowie Publication in view of Cattaneo et al. (U.S. Patent Application Publication No. US 2003/0058963, hereafter the "Cattaneo Publication"). Claim 26 stands rejected under 35 U.S.C. § 103(a) as allegedly unpatentable over the Cowie Publication in view of Batra et al.

(U.S. Patent 7,397,870, hereafter the "Batra Publication"). Claim 27 stands rejected under 35 U.S.C. § 103(a) as allegedly unpatentable over the Cowie et al. Publication in view of Sahinoglu et al. (U.S. Patent 7,436,909, hereafter the "Sahinoglu Patent") in view of Iwakami et al. (U.S. Patent 5,684,920, hereafter the "Iwakami Patent"). Claim 28 stands rejected under 35 U.S.C. § 103(a) as allegedly unpatentable over the Cowie Publication in view of Barnes et al. (U.S. Patent 6,552,677, hereafter the "Barnes Patent"). Claim 29 stands rejected under 35 U.S.C. § 103(a) as allegedly unpatentable over the Cowie Publication in view of the Barnes Patent, and further in view of Ross et al. (U.S. Patent 5,337,054, hereafter the "Ross Patent"). Claim 30 stands rejected under 35 U.S.C. § 103(a) as allegedly unpatentable over the Cowie Publication in view of Lomp et al. (U.S. Patent 5,991,332, hereafter the "Lomp Patent"). Claim 32 stands rejected under 35 U.S.C. § 103(a) as allegedly unpatentable over the Cowie Publication in view of the Cattaneo Publication, and further in view of Takamura et al. (U.S. Patent Application Publication No. US 2003/0035465, hereafter the "Takamura Publication").

In view of the present amendment, Applicants respectfully traverse the Examiner's rejections and request reconsideration of the claims of the above-captioned application for the following reasons.

C. <u>Applicants' Arguments</u>

In view of the present amendment, claims 18-36 are in compliance with 35 U.S.C. § 112.

i. <u>The Section 102 Rejection</u>

Anticipation under 35 U.S.C. § 102 requires showing the presence in a single prior art reference disclosure of each and every element of the claimed invention, arranged as in the claim. <u>Lindemann Maschinenfabrik GMBH v. American Hoist & Derrick</u>, 221 U.S.P.Q. 481, 485 (Fed. Cir. 1984). In this case, the Examiner has failed to establish a <u>prima facie</u> case of

anticipation against the claims of the above-captioned application because the Cowie Publication does not teach, or suggest, each and every limitation of claims 18-23, 25, 31, 33 and 34.

ii. The Cowie Publication

The Cowie Publication discloses a "method and apparatus for receiving a plurality of time spaced signals," which pertains to a method and system for receiving time spaced signals transmitted in accordance with a time layout, wherein the time spaced signals may be pulses or bursts (See Abstract of the Cowie Publication). The time spaced signals convey at least one intelligence signal, and the time spaced signals are received at an antenna (See Abstract of the Cowie Publication). Once received, the time spaced signals may be coherently detected, wherein the coherent detection may be accomplished by correlating the received signals with a template signal (See Abstract of the Cowie Publication). According to the Cowie Publication, the detection process can also include integration of the received signals (See Abstract of the Cowie Publication). The coherently detected signals are then contributed to a plurality of intermediate signals based on an interleaving order, which may be predetermined or specified by an interleaving code. and each of the plurality of intermediate signals can then be separately integrated to produce bits of data (See Abstract of the Cowie Publication). The Cowie Publication further discloses that the bits of data are ordered to produce the at least one intelligence signal based on a bit order, which may be predetermined or specified by a bit ordering code (See Abstract of the Cowie Publication).

The Cowie Publication discloses an ultra-wide band (UWB) method and apparatus for receiving several time spaced UWB signals, wherein the UWB signals are received by an antenna (904) of the apparatus shown in Figure 9 in order to be correlated in a correlator (910) with a replica generated via a precision time generator (914), (Cowie Publication, ¶¶

0155] to [0157]). The apparatus of Figures 8 and 9 of the Cowie Publication are reproduced below for the Examiner's reference.

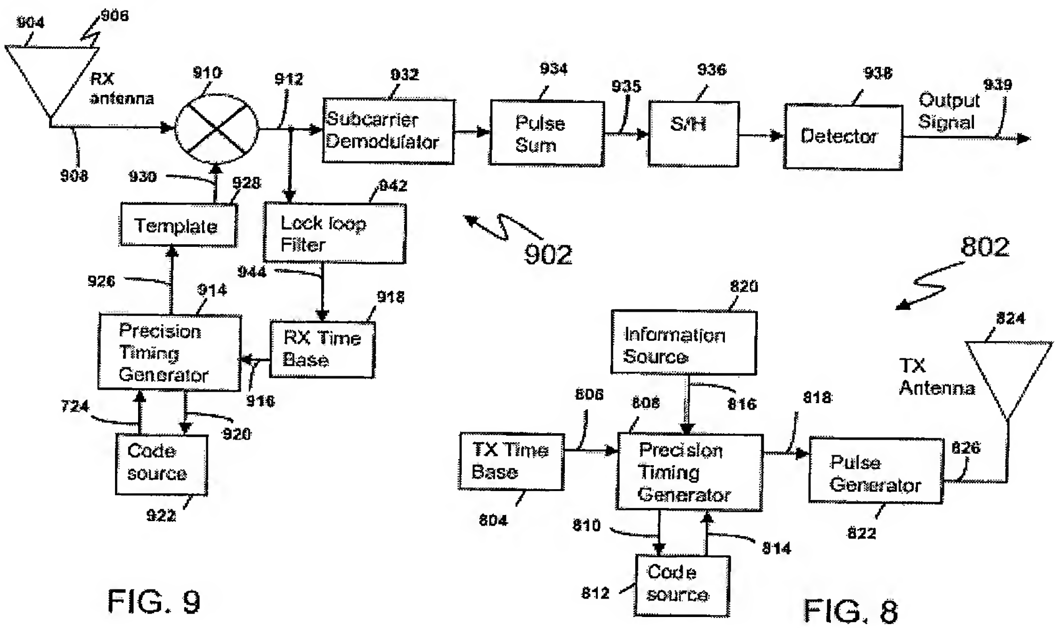


FIG. 9

FIG. 8

In order to obtain a replica like the encoding of the signals picked up by the antenna (906), the generator (914) is clocked by a clock signal (916) of a time base (918), and receives a code control signal (724) from code source (922), (Cowie Publication, ¶ [0157]). At the correlator output (912), the intermediate signals undergo temporal integration prior to demodulation and summation of the pulses in order to retrieve information from the received UWB signals (Cowie Publication, ¶ [0158]). Thus, as would be immediately appreciated by a person of ordinary skill in the art, the Cowie Publication discloses that summation or addition of the pulses takes place **after** the demodulation operation, which is substantially different from the addition of N time windows in accordance with the present invention that takes place **before** the demodulation operation.

Therefore, the Cowie Publication does not teach, or suggest, (i)

> "carrying out, in the receiver device, an operation of adding the N windows in a coherent manner before data demodulation so that added pulse amplitude level is higher than noise amplitude level captured by the receiver

device,"

as recited by independent claim 18. However, this is not the only deficiency in the disclosure of the Cowie Publication.

The Cowie Publication discloses coherent detection of picked-up UWB signals. More specifically, the Cowie Publication discloses performing a correlation of picked-up signals using at least one waited replica of determined time space pulses (See, e.g., Cowie Publication, Figures 10A, 10B, 10C, and ¶ [0161]). This correlation of picked-up signals does not correspond to an addition of time windows, which are positioned according to the position of each pulse of a sequence of pulses as defined in claims 18 and 36. In other words, the Cowie Publication does not teach, or suggest, (ii) "<u>each of the N reception time windows is positioned in time as a function of a known theoretical arrangement of the N pulses of the signals transmitted by the transmitter device</u>" as recited by independent claims 18 and 36.

In fact, the correlation operation according to the Cowie Publication, ¶ [0158], is carried out before the summation of pulses. With reference to Figure 11 and ¶ [0168] of the Cowie Publication, pulses 1101(a) to 1104(a) are integrated to generate first data bit. However, this is substantially different from a coherent addition of time windows, i.e., "<u>an operation of adding the N windows in a coherent manner</u>," as recited by independent claims 18 and 36. Furthermore, as shown in Figure 9, the addition of pulses (934) concerns only pulses obtained after the demodulation operation is performed by the subcarrier demodulator (932). This is a drawback of Cowie's apparatus, which makes it necessary to carry out a correlation operation before the demodulation operation, which results in the fact that one cannot reduce the consumption of the apparatus. Therefore, the Cowie Publication also does not teach, or suggest, (iii)

> "carrying out, in the receiver device, <u>an operation of adding the N windows in a coherent manner</u> before data demodulation <u>so that added pulse amplitude level is higher than noise amplitude level captured by the receiver device</u>,"

as recited by independent claim 18. The Cowie Publication also does not teach, or suggest, (iv) "wherein said time window width is adapted to receive the pulses of the direct path and multiple path signals captured by the receiver device of width greater than 20 ns" as recited by claim 22. In fact, the Cowie Publication is silent with respect to the feature wherein width of the time windows that is in relation to the reverse of mean pulse repetition frequency, which according to the present invention allows for the advantageous reduction of consumption of the receiver.

For all of the above reasons, the Examiner has failed to establish a prima facie case of anticipation against claims 18-23, 25, 31, 33 and 34 of the above-captioned application.

iii. The Section 103 Rejection

A prima facie case of obviousness requires a showing that the scope and content of the prior art teaches each and every element of the claimed invention, and that the prior art provides some teaching, suggestion or motivation, or other legitimate reason, for combining the references in the manner claimed. KSR International Co. v. Teleflex Inc., 127 S.Ct. 1727, 1739-41 (2007); In re Oetiker, 24 U.S.P.Q.2d 1443 (Fed. Cir. 1992). In this case, the Examiner has failed to establish a prima facie case of obviousness against Applicants' claimed invention because the combination of the Cowie Publication, the Cattaneo Publication, the Batra Patent, the Iwakami Patent, the Barnes Patent, the Ross Patent, the Lomp Patent, the Takamura Publication, and the Sahinoglu Patent fails to teach, or suggest, each and every limitation of claims 18-36.

iv. The Cowie Publication

The disclosure of the Cowie Publication, and its deficiencies, are discussed above. As admitted by the Examiner (Office Action, dated June 9, 2009, at 10, lines 19-20; at 11, lines

13-14; at 13, lines 1-5; at 14, line 16, to 15, line 2; at 16, line 19, to 17, line 4; at 18, lines 9-17; and at 20, lines 7-11), the Cowie Publication also does not teach, or suggest, (iv) that "the time window signals are successively added and stored in at least one register of the second signal processing unit" as recited by claim 24, (v) "the reference signals of identical polarity to the polarity of the coded signals received by the receiver device are correlated prior to addition of the resulting pulses of each time window" as recited by claim 26, (vi) "means for estimating the time of arrival of the coded data signals" and steps (d) and (e) of claim 27, (vii) "calculating a positive envelope of the signals of one time window" and sub-steps (i), (ii) and (iii) of claim 28, (viii) "estimating the maximum local point of the positive envelope at the coordinates that directly follow the point where the positive envelope passes above the threshold th, and the minimum local point of the envelope at the coordinates that precede the point where the positive envelope passes above the threshold th" and related sub-steps of claim 29, (ix) "the second signal processing unit includes control means for providing control signals to digital window addition means in order to modify the time or mean repetition frequency scale of N windows to be added from digital window addition means" and the "re-sampling operation" recited by claim 30, and (x)

> "wherein the clock signal frequency of the oscillator stage is proportionally adapted by the processing unit to a reference clock signal frequency of an oscillator stage of the transmitter device by controlling the pulse amplitude level of a final addition window of the N windows from the addition means until said amplitude level is maximised, wherein the oscillator stage is used to generate ultra-wide band coded data signals"

as recited by claim 32.

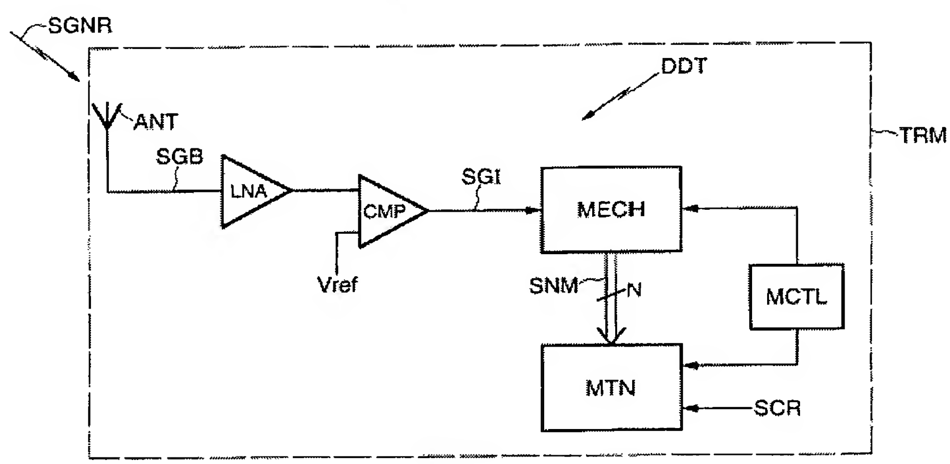
v. <u>The Cattaneo Publication</u>

The Cattaneo Publication discloses a "method and device for decoding an incident pulse signal of the ultra wideband type, in particular for a wireless communication system," wherein an incident pulse signal of the ultra wideband type conveys digital information that is

coded using pulses having a known theoretical shape (See Abstract of the Cattaneo Publication). According to Cattaneo, a decoding device includes an input for receiving the incident signal, and for delivering a base signal, and a comparator receives the base signal and delivers an intermediate signal representative of the sign of the base signal with respect to a reference (See Abstract of the Cattaneo Publication). A sampling circuit samples the intermediate signal for delivering a digital signal, and a digital processing circuit correlates the digital signal with a reference correlation signal corresponding to a theoretical base signal arising from the reception of a theoretical pulse having the known theoretical shape (See Abstract of the Cattaneo Publication).

Thus, the Cattaneo Publication discloses a method and device for receiving ultra-wide band type pulse signals, wherein the UWB signals include a heading frame for seeking synchronism in the reception device (Cattaneo Publication, ¶ [0020]). To do this as shown in Figure 5, reproduced below for convenience, the UWB signals (SNGR) are received by an

FIG.5



antenna (ANT) of the device in order to first be compared to a threshold voltage V_{ref} in a comparator (CMP), (Cattaneo Publication, ¶¶ [0047] to [0049]). At the output of the comparator (CMP), intermediate signals (SGI) represent the sign of the received signal in

relation to a threshold voltage, and these intermediate signals (SGI), which can include different segments of a synchronization header, are then sampled by sampling means (MECH), and sliding correlation is performed on a final set of samples using a reference replica to remove noise (Cattaneo Publication, ¶¶ [0050]).

The Cattaneo Publication discloses a coherent integration that is performed to mitigate problems due to noise during a synchronization or channel estimation phase (Cattaneo Publication, ¶¶ [0022], [0068]). In Figure 13, reproduced below for convenience, the Cattaneo Publication shows N3 successive digital samples that are successively added,

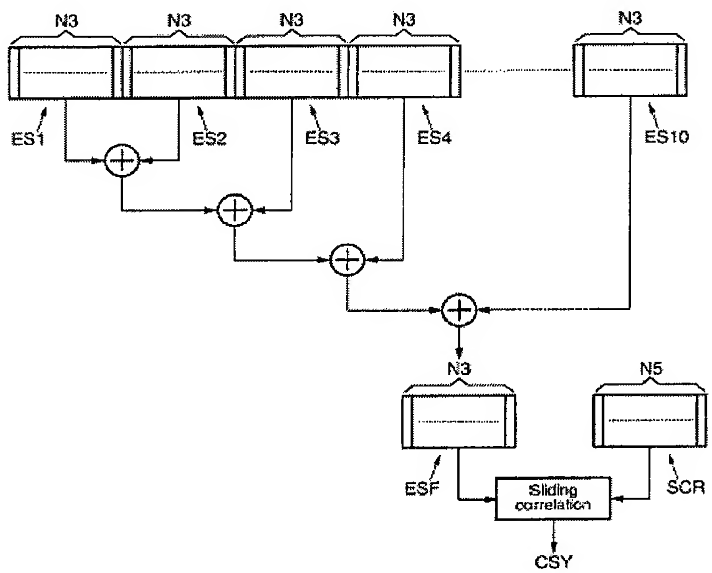


FIG.13

and with a final window, a sliding correlation is carried out with N5 reference samples. These time windows are successive in time, thus limiting their application to the synchronization or channel estimation phase, which is substantially different from time windows of the present invention. In particular, the Cattaneo Publication does not teach, or suggest, positioning of the time windows as a function of the known position of each pulse wherein the arrangement of pulses represents encoding of data according to claim 18, and wherein each window has a width smaller than the reverse of repetition frequency (PRF). Therefore, the Cattaneo Publication does not teach, or suggest, (i) "<u>each of the N reception</u>

time windows is positioned in time as a function of a known theoretical arrangement of the N pulses of the signals transmitted by the transmitter device" as recited by claim 18, and (ii)

> "the identical width of each of the N time windows is smaller than the reverse of the mean pulse repetition frequency of a sequence of coded data signals to be transmitted, and wherein said time window width is adapted to receive the pulses of the direct path and multiple path signals captured by the receiver device of width greater than 20 ns"

as recited by claim 22.

Furthermore, the Cattaneo Publication is silent with respect to adapting the clock frequency by means of the addition of time windows by maximizing the added pulses. Therefore, the Cattaneo Publication also does not teach, or suggest, (iii)

> "a clock signal frequency for clocking various operations of the receiver device is proportionally adapted to a reference clock signal frequency of the transmitter device by controlling the pulse amplitude level of a final window adding the N windows until said amplitude level is maximised, wherein the clock signal frequency is used to generate ultra-wide band coded data signals,"

as recited by claim 19. Furthermore, it is not possible, with the device disclosed by the Cattaneo Publication, to use pulse polarity modulation with the comparison of the received signal to V_{ref} shown in Figure 5 because the device depends on the sign of the received signal. Therefore, the Cattaneo Publication cannot teach, or suggest, (iv) "the data is coded by pulse position modulation of each sequence, or by pulse polarity or by phase modulation of each sequence, or by pulse position and polarity modulation of each sequence" as recited by claim 20.

As admitted by the Examiner (Office Action, dated June 9, 2009, at 21, lines 1-3), the Cattaneo Publication does not teach, or suggest, (v)

> "wherein the clock signal frequency of the oscillator stage is proportionally adapted by the processing unit to a reference clock signal frequency of an oscillator stage of the transmitter device by controlling the pulse amplitude level of a final addition window of the N windows from the addition means until said amplitude level is maximised, wherein the oscillator stage is used to generate ultra-wide band coded data signals,"

as recited by claim 32.

vi. The Batra Patent

The Batra Patent discloses an "ultra-wideband (UWB) receiver," which includes a system and method for maximizing a signal strength of a received signal pulse, wherein the system comprises a self-adjusting correlator/integrator (325) that uses no historical timing information (See Abstract of the Batra Patent, and Figure 3). The self-adjusting correlator/integrator according to the Batra Patent uses a plurality of simple correlators/integrators, such as correlator/integrator (805), which are configured to process a received signal at various times surrounding the signal pulse's expected arrival (See Abstract of the Batra Patent, and Figure 3). A comparator, such as comparator (820), selects an output of the simple correlators/integrators with greatest magnitude (See Abstract of the Batra Patent, and Figure 3).

In particular, the Batra Patent discloses the use of two correlators (905), (925), and the combination of their outputs as shown in Figure 9b by selecting the largest of the outputs (Batra Patent, col. 11, lines 49-64). The first correlator (905) is matched to a positive amplitude and the second correlator (925) is matched to a negative amplitude (Batra Patent, col. 11, lines 54-57). Consequently, as would be instantly appreciated by a person of ordinary skill in the art, the device disclosed by the Batra Patent is insensitive to pulse polarity and is, therefore, not equipped to reject pulses with non-expected polarity. However, the method according to claim 26 of the above-captioned application rejects pulses with a polarity that does not match the polarity of the reference signal by first applying the polarity of the reference signal to the received signal. Thus, the Batra Patent does not teach, or suggest, "wherein the reference signals of identical polarity to the polarity of the coded

signals received by the receiver device are correlated prior to addition of the resulting pulses of each time window" as recited by claim 26.

In view of the fact that the rejection of pulses in accordance with the invention of claim 26 offers improved performance in the case of interference, the Batra Patent is neither relevant to the subject matter disclosed by the Cowie Publication nor relevant to the subject matter recited by claim 26.

vii. The Sahinoglu Patent

The Sahinoglu Patent discloses a "method for estimating time of arrival of received signals for ultra wide band impulse radio systems," and issued on October 14, 2008 from U.S. Patent Application No. 10/988,764, which was filed on November 15, 2004. Thus, the Sahinoglu Patent is effective as a reference as of November 15, 2004.

The present application was filed on July 10, 2006, and is a U.S. National phase application of International Application No. PCT/EP2004/014515 filed December 12, 2004, and which claims priority to European Patent Application No. 0400021.0 filed on January 8, 2004. Applicants file herewith a certified English translation of European Patent Application No. 0400021.0, thereby perfecting Applicants' priority claim to January 8, 2004 because Applicants have previously made a claim to priority and the United States Patent and Trademark Office (USPTO) should have received a copy of the certified copy of Applicants' foreign priority document from the International Bureau. See, e.g., MPEP § 201.14.

In view of the above facts, Applicants have perfected their priority claim so that the claims of the above-captioned application are entitled to a priority date of January 8, 2004, which is earlier than the effective date (i.e., November 15, 2004) of the Sahinoglu Patent as prior art. Therefore, **the Sahinoglu Patent is not valid prior art against the claims of the**

above-captioned application. No further comment regarding the Sahinoglu Patent is believed to be required.

viii. The Iwakami Patent

The Iwakami Patent discloses an "acoustic signal transform coding method and decoding method having a high efficiency envelope flattening method therein," wherein an input acoustic signal is subjected to modified discrete cosine transform processing to obtain its spectrum characteristics (See Abstract of the Iwakami Patent). The Iwakami Patent discloses that linear prediction coefficients are derived from the input acoustic signal in a linear prediction coding analysis part, and the prediction coefficients are subjected to Fourier transform in a spectrum envelope calculation part to obtain the envelope of the spectrum characteristics of the input acoustic signal (See Abstract of the Iwakami Patent). According to Iwakami, in a normalization part the spectrum characteristics are normalized by the envelope thereof to obtain residual coefficients, and another normalization part normalizes the residual coefficients by a residual-coefficients envelope predicted in a residual-coefficients envelope calculation part, thereby obtaining fine structure coefficients, which are vector-quantized in a quantization part (See Abstract of the Iwakami Patent). The Iwakami Patent also discloses that a de-normalization part de-normalizes the quantized fine structure coefficients, and the residual-coefficients envelope calculation part uses the reproduced residual coefficients to predict the envelope of residual coefficients of the subsequent frame (See Abstract of the Iwakami Patent).

A person of ordinary skill in the art would realize that the Iwakami Patent discloses (i) compression of audio signals by calculating a frequency representation of a time limited signal, (ii) a prediction algorithm to calculate an expected frequency representation based on the previous one, (iii) an estimation of the amplitude of the frequency representation, (iv) an

estimation of residual coefficient based on the expected and the calculated frequency representation, and (v) a quantification of the residual coefficients (See, e.g., Iwakami Patent, col. 2, line 40, to col. 4, line 27). The estimation of the amplitude of the frequency representation disclosed by Iwakami Patent is not relevant to the estimation of noise of a signal because signal amplitude and noise amplitude are generally not correlated. Therefore, the Iwakami Patent, either alone or in combination with the Cowie Publication, does not teach or suggest "estimating a noise amplitude level by selecting the minimum amplitude value from all the calculated amplitude values" as recited by claims 27 and 36.

ix. The Barnes Patent

The Barnes Patent discloses a "method of envelope detection and image generation," which pertains to a method of detecting objects reflecting impulse waveforms of generating a detection envelope by receiving a reflected waveform, and delaying the waveform by a peak-to-zero delay (PZD) interval (See Abstract of the Barnes Patent). According to the Barnes Patent, the PZD interval is the time between a maximum energy displacement in the impulse waveform and an adjacent zero crossing (See Abstract of the Barnes Patent). The Barnes Patent discloses that the reflected waveform and its delayed version are squared and then summed to create the envelope (See Abstract of the Barnes Patent). If the envelope is to be defined in terms of voltage, the root of the sum of the squares may be found (See Abstract of the Barnes Patent). The Barnes Patent also discloses a method for generating an image using the PZD interval in back-projection techniques, wherein a sampling point is chosen on each of a plurality of reflected waveforms, and the values of the samples are summed and the waveforms are delayed by the PZD interval and the values of the sampling points are again summed (See Abstract of the Barnes Patent). The Barnes Patent further discloses that the two

sums are squared and added together to generate an image envelope (See Abstract of the Barnes Patent).

In sum, the Barnes Patent discloses the estimation of the envelope by several approaches that are evident from claims 1, 2 and 8 of the Barnes Patent. These different approaches may be summarized by defining the received signal x(t) and the signal y(t) = x(t-\tau), where "\tau" is calculated using the time between the maximum amplitude or maximum energy of x(t) and the next zero crossing that follows. Thus, the method according to claim 1 of Barnes estimates the envelope as x^2(t) + y^2(t), and the method according to claim 2 estimates the envelope as \sqrt{x^2(t) + y^2(t)}, and the method according to claim 8 estimates the envelope as |x(t)| + |y(t)|. These three estimation approaches are appropriate based on the use of a Hilbert transform. However, these three estimation approaches are substantially different from the method according to claim 28 of the above-captioned application, which is based on the estimation of the maximum values in intervals defined by the zero-crossings and subsequent interpolation. In fact, the envelope estimation techniques disclosed by the Barnes Patent will degrade in the presence of noise mostly because the estimation of \tau relies on two values of the signal only. The invention according to claim 28 of the above-captioned application solves this shortcoming.

For all of the above reasons, the Barnes Patent does not teach, or suggest,

> "(d) calculating a positive envelope of the signals of one time window by
> i. determining all the zero crossing positions p_i of the time window signals;
> ii. determining the coordinates of the absolute value amplitude maximum in each interval from p_i to p_{i+1}, with i ranging from 1 to I-1, wherein I is an integer number higher than 3; and
> iii. calculating the positive envelope by using a specific interpolation algorithm passing through the determined coordinates,"

as recited by claim 28.

x. <u>The Ross Patent</u>

The Ross Patent discloses a "coherent processing tunnel diode ultra wideband receiver," wherein a four-terminal network in tandem with a tunnel diode (TD) threshold receiver used in radar or communications improves its sensitivity. (See Abstract of the Ross Patent). The Ross Patent discloses that the use of a threshold detector and a control of the threshold level may achieve a constant false alarm rate (CFAR), (See Abstract of the Ross Patent). The invention according to claim 29 of the above-captioned application, however, uses a threshold detector for a coarse "time of arrival" (TOA) estimation, which means that improvement of the accuracy of the TOA estimation is achieved by use of an approximation of the envelope using, for example, an affine function (claim 35), and the extraction of the TOA from the approximation of the envelope.

The improvement in accuracy of TOA estimation is not contemplated by the Ross Patent. Therefore, the Ross Patent is not relevant to the subject matter disclosed by the Cowie Publication because the Ross Patent does not teach, or suggest,

> "(e) calculating the time of arrival of the first signals captured by the receiver device by
>
> i. calculating an amplitude threshold th based on the amplitude maximum of the envelope and an estimated noise amplitude level;
>
> ii. estimating the rising edge of the positive envelope where the threshold th is exceeded for the first time;
>
> iii. estimating the maximum local point of the positive envelope at the coordinates that directly follow the point where the positive envelope passes above the threshold th, and the minimum local point of the envelope at the coordinates that precede the point where the positive envelope passes above the threshold th;
>
> iv. calculating the intermediate coordinates between the minimum point and the maximum point;
>
> v. approximating at the position of intermediate coordinates a selected segment of samples of the positive envelope with a given function; and
>
> vi. determining the time of arrival of the first signals captured by the receiver device at the zero crossing or another value of the determined function,"

as recited by claim 29.

xi. The Lomp Patent

The Lomp Patent discloses a "adaptive matched filter and vector correlator for a code division multiple access (CDMA) modem," wherein the CDMA modem includes (a) a modem transmitter having a code generator that provides an associated pilot code signal and that generates a plurality of message code signals, a spreading circuit that produces a spread-spectrum message signal by combining each of the information signals with a respective one of the message code signals, and a global pilot code generator that provides a global pilot code signal to which the message code signals are synchronized, and (b) a modem receiver having an associated pilot code generator and a group of associated pilot code correlators for correlating code-phase delayed versions of the associated pilot signal with a receive CDM signal to produce a despread associated pilot signal (See Abstract of the Lomp Patent). The code phase of the associated pilot signal is changed responsive to an acquisition signal value until a pilot signal is received, and the associated pilot code tracking logic adjusts the associated pilot code signal in phase responsive to the acquisition signal so that the signal power level of the despread associated pilot code signal is maximized (See Abstract of the Lomp Patent). The Lomp Patent discloses that the CDMA modem receiver includes a group of message signal acquisition circuits, each including a plurality of receive message signal correlators, which correlate respective local received message code signal to the CDM signal to produce a respective despread received message signal (See Abstract of the Lomp Patent).

However, the Lomp Patent is silent with respect to re-sampling. Therefore, the Lomp Patent does not teach, or suggest,

> "<u>a re-sampling operation</u> is carried out in the second signal processing unit of the receiver device with <u>a different re-sampling frequency</u> from the sampling frequency of the analogue-digital conversion stage, wherein <u>said re-sampling frequency generated by the control means is higher than the sampling frequency in order to increase precision for positioning purposes</u>,"

as recited by claim 30.

xii. The Takamura Publication

The Takamura Publication discloses a "radio communications system, transmitter, receiver, radio transmission method, radio reception method and computer program therefor," wherein the radio communications system can accurately discriminate a desired signal from interfering signals, even when signals from a plurality of transmitters are received simultaneously, wherein the transmitter for this system communicates information using signals which are repeated over predetermined periods (See Abstract of the Takamura Publication). According to the Takamura Publication, a pulse generator generates pulses having a predetermined repetition period based on an information bit to be communicated, and transmission means transmit the pulses generated by the pulse generator (See Abstract of the Takamura Publication). Furthermore, pulse amplitude alterating means control the amplitude of the pulses to be transmitted by the transmitting means in accordance with a predefined pattern under the control of a control unit (See Abstract of the Takamura Publication).

The Takamura Publication discloses a UWB pulse transmitter, which can use pulse amplitude modulation (Takamura Publication, ¶¶ [0006], [0014], [0036] and [0037]). The information for the pulse amplitudes is generated using the "pulse amplitude alterating means" (See Abstract of the Takamura Publication). However, the invention according to claim 32 of the above-captioned application tunes the clock signal frequency of the receiver device so that the amplitude level of a final addition window is maximized. The Takamura Publication does not teach, or suggest, the "pulse amplitude alterating section" is applied to the receiver device or to a clock signal frequency tuning device. Consequently, the Takamura Publication does not teach, or suggest,

"the clock signal frequency of the oscillator stage is proportionally adapted

> by the processing unit to a reference clock signal frequency of an oscillator stage of the transmitter device by controlling the pulse amplitude level of a final addition window of the N windows from the addition means until said amplitude level is maximised, wherein the oscillator stage is used to generate ultra-wide band coded data signals,"

as recited by claim 32. Thus, the Takamura Publication is not relevant to the subject matter disclosed by the Cowie Publication.

xiii. Claims 27 and 36

As discussed above, the Sahinoglu Patent is not valid prior art against the claims of the above-captioned application. Therefore, the Examiner's obviousness rejection of amended claim 27 under 35 U.S.C. § 103(a), which is based on the Sahinoglu Patent, is untenable and must be withdrawn. Likewise, new independent claim 36, which corresponds to previous claim 27 re-written in independent form, is allowable over the art of record because the Sahinoglu Patent is not valid prior art, and the combination of the Cowie Publication, the Cattaneo Publication, the Batra Patent, the Iwakami Patent, the Barnes Patent, the Ross Patent, the Lomp Patent and the Takamura Publication, fail to teach or suggest "the second signal processing unit includes means for adding the digital windows and **means for estimating the time of arrival of the coded data signals**" as recited by claims 27 and 36.

For all of the above reasons, the Examiner has failed to establish a prima facie case of obviousness against claims 27 and 36.

xiv. Summary of the Disclosures

The Sahinoglu Patent is not valid prior art against the clams of the above-captioned application. Therefore, no further comment regarding the Sahinoglu Patent is believed to be required.

The Cowie Publication, the Cattaneo Publication, the Batra Patent, the Iwakami Patent, the Barnes Patent, the Ross Patent, the Lomp Patent and the Takamura Publication, taken either alone or in combination, fails to teach, or suggest, (i)

> "carrying out, in the receiver device, an operation of adding the N windows <u>in a coherent manner</u> <u>before data demodulation</u> so that added pulse amplitude level is higher than noise amplitude level captured by the receiver device,"

as recited by independent claim 18, and (ii) "<u>each of the N reception time windows is positioned in time as a function of a known theoretical arrangement of the N pulses of the signals transmitted by the transmitter device</u>" as recited by independent claims 18 and 36.

With respect to claim 26, the Batra Patent does not teach or suggest "<u>wherein the reference signals of identical polarity to the polarity of the coded signals received by the receiver device are correlated prior to addition of the resulting pulses of each time window</u>" as recited by claim 26. Therefore, the combination of the Cowie Publication and the Batra Patent fails to render obvious the subject matter of claim 26.

With respect to claim 28, the Batra Patent does not teach or suggest

> "(d) calculating a positive envelope of the signals of one time window by
> i. determining all the zero crossing positions p_i of the time window signals;
> ii. determining the coordinates of the absolute value amplitude maximum in each interval from p_i to p_{i+1}, with i ranging from 1 to I-1, wherein I is an integer number higher than 3; and
> iii. calculating the positive envelope by using a specific interpolation algorithm passing through the determined coordinates,"

as recited by claim 28. Therefore, the combination of the Cowie Publication and the Barnes Patent fails to render obvious the subject matter of claim 28.

With respect to claim 29, the Ross Patent does not teach or suggest

> "(e) calculating the time of arrival of the first signals captured by the receiver device by
> i. calculating an amplitude threshold th based on the amplitude maximum of the envelope and an estimated noise amplitude level;
> ii. estimating the rising edge of the positive envelope where the threshold th is exceeded for the first time;
> iii. estimating the maximum local point of the positive envelope

> at the coordinates that directly follow the point where the positive envelope passes above the threshold th, and the minimum local point of the envelope at the coordinates that precede the point where the positive envelope passes above the threshold th;
>
> iv. calculating the intermediate coordinates between the minimum point and the maximum point;
>
> v. approximating at the position of intermediate coordinates a selected segment of samples of the positive envelope with a given function; and
>
> vi. determining the time of arrival of the first signals captured by the receiver device at the zero crossing or another value of the determined function,"

as recited by claim 29. Therefore, the combination of the Cowie Publication, the Barnes Patent, and the Ross Patent fails to render obvious the subject matter of claim 29.

With respect to claim 30, the Lomp Patent does not teach or suggest

> "<u>a re-sampling operation</u> is carried out in the second signal processing unit of the receiver device with <u>a different re-sampling frequency</u> from the sampling frequency of the analogue-digital conversion stage, wherein <u>said re-sampling frequency generated by the control means is higher than the sampling frequency in order to increase precision for positioning purposes</u>,"

as recited by claim 30. Therefore, the combination of the Cowie Publication and the Lomp Patent fails to render obvious the subject matter of claim 30.

With respect to claim 32, the Takamura Publication does not teach or suggest

> "the clock signal frequency of the oscillator stage is proportionally adapted by the processing unit to a reference clock signal frequency of an oscillator stage of the transmitter device by controlling the pulse amplitude level of a final addition window of the N windows from the addition means until said amplitude level is maximised, wherein the oscillator stage is used to generate ultra-wide band coded data signals,"

as recited by claim 32. Therefore, the combination of the Cowie Publication, the Cattaneo Publication and the Takamura Publication fails to render obvious the subject matter of claim 32.

For all of the above reasons, the combination of the Cowie Publication, the Cattaneo Publication, the Batra Patent, the Iwakami Patent, the Barnes Patent, the Ross Patent, the Lomp Patent and the Takamura Publication fails to establish a <u>prima facie</u> case of obviousness against claims 18-36 of the above-captioned application.

xv. No Legitimate Reason to Combine the Disclosures as Proposed and No Reasonable Expectation of Success Even if the Combinations Were Made

A proper rejection under Section 103 requires showing (1) that a person of ordinary skill in the art would have had a legitimate reason to attempt to make the composition or device, or to carry out the claimed process, and (2) that the person of ordinary skill in the art would have had a reasonable expectation of success in doing so. PharmaStem Therapeutics, Inc. v. ViaCell, Inc., 491 F.3d 1342, 1360 (Fed. Cir. 2007). In this case, the object of the present invention is to provide a method via encoded ultra-wide band data signals, in particular, for maximizing the amplitude of the data pulses in relation to the noise picked up by the receiver device, and to provide the receiver device for implementing the method. In order to achieve this objective, the present invention adds N time windows, which include each one of N pulses per sequence. The N time windows are positioned in time as a function of a known theoretical arrangement of the N pulses of the picked-up signals. Thus, according to the position of the N time windows, the coherent addition of the windows allows maximizing of the amplitude of the resulting pulse(s) above the noise.

The Sahinoglu Patent is not even valid prior art. The remaining disclosures, namely, the Cowie Publication, the Cattaneo Publication, the Batra Patent, the Iwakami Patent, the Barnes Patent, the Ross Patent, the Lomp Patent and the Takamura Publication fails to disclose the addition of N windows in the manner claimed. Therefore, a person of ordinary skill in the art would have no legitimate reason to combine the disclosures of this many documents, and the person of ordinary skill in the art would not have had a reasonable expectation of success of obtaining the Applicants' claimed invention even if the disclosures of the various documents asserted by the Examiner were combined. In particular, a person of ordinary skill

in the art would have no reason to combine the disclosure of the Cattaneo Publication with the disclosure of the Cowie Publication because neither document teaches, or even suggests, employing coherent addition of the N windows before performing a demodulation operation in order to maximize the amplitude of the resulting pulses above noise.

For all of the above reasons, the Examiner has failed to establish a prima facie case of obviousness against claims 18-36 of the above-captioned application.

III. CONCLUSION

Claims 18-36 are in compliance with 35 U.S.C. § 112. Furthermore, the Examiner has failed to establish a prima facie case of anticipation against any claim of the above-captioned application because the Cowie Publication does not teach, or suggest, each and every limitation recited by independent claims 18 and 36. Likewise, the Examiner has failed to establish a prima facie case of obviousness against claims 18-36 because the combination of the Cowie Publication, the Cattaneo Publication, the Batra Patent, the Iwakami Patent, the Barnes Patent, the Ross Patent, the Lomp Patent, the Takamura Publication, and the Sahinoglu Patent, fails to teach each and every limitation of the claims arranged as in the claims. In fact, the Sahinoglu Patent is not valid prior art against the claims of the above-captioned application. In addition, the Examiner has failed to adduce any legitimate reason for combining the disclosures of the Cowie Publication, the Cattaneo Publication, the Batra Patent, the Iwakami Patent, the Barnes Patent, the Ross Patent, the Lomp Patent, the Takamura Publication, and the Sahinoglu Patent, and the Examiner has failed to demonstrate that a person of ordinary skill in the art would have had a reasonable expectation of success of obtaining Applicants' claimed invention even if the combinations of the Cowie Publication, the Cattaneo Publication, the Batra Patent, the Iwakami Patent, the Barnes Patent, the Ross Patent, the Lomp Patent, the Takamura Publication, and the Sahinoglu Patent, were made.

For all of the above reasons, claims 18-36 are in condition for allowance, and a prompt notice of allowance is earnestly solicited.

Questions are welcomed by the below-signed attorney for Applicants.

Respectfully submitted,

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